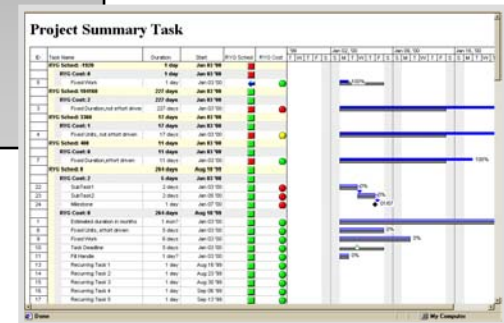
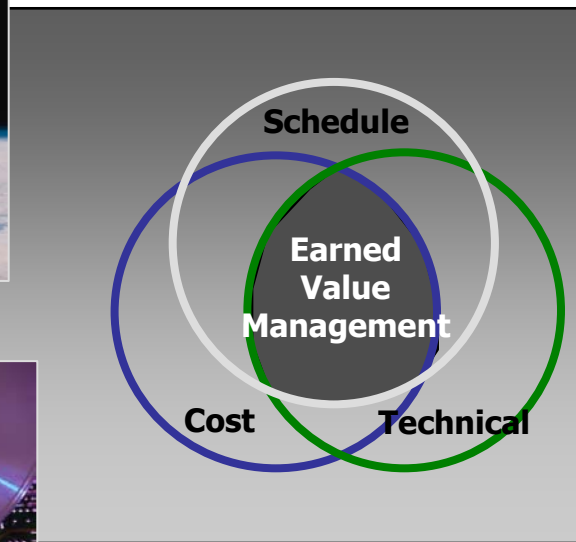


Schedule Analysis



Presented by:
Peg Johnson
Programmatics, LLC
703.924.3399

Measuring Performance

To Complete

Performance Index (TCPI)

Estimate To Complete (ETC) Cost Variance (CV)

Schedule Variance (SV) Variance At Complete (VAC)

Schedule Variance % Estimate At Complete (EAC)

Cost Efficiency Cost Variance %

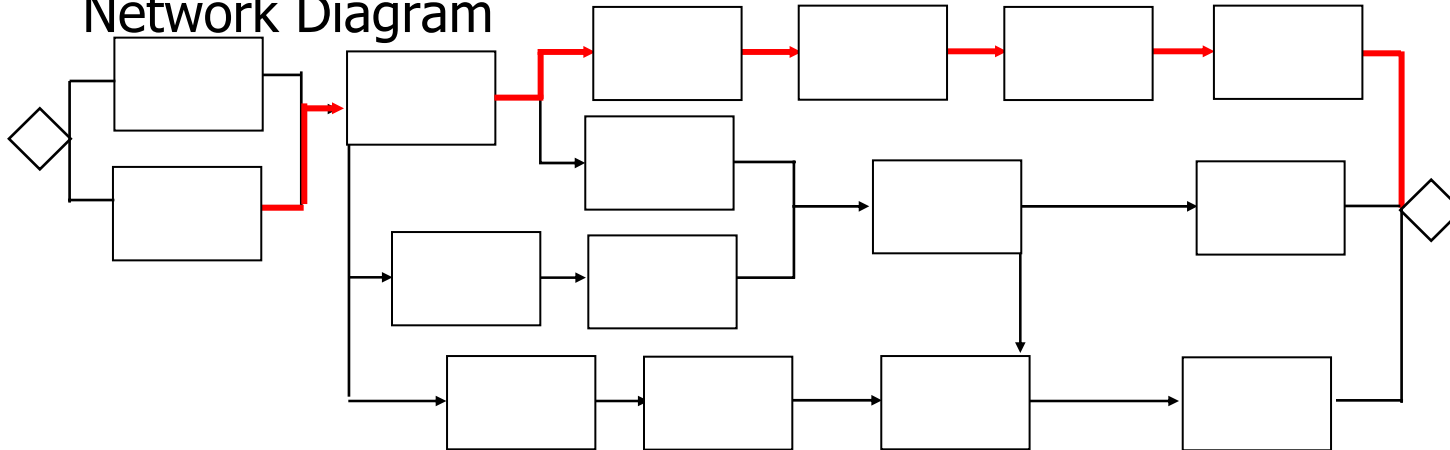
Percent Spent Schedule Efficiency

Percent Complete

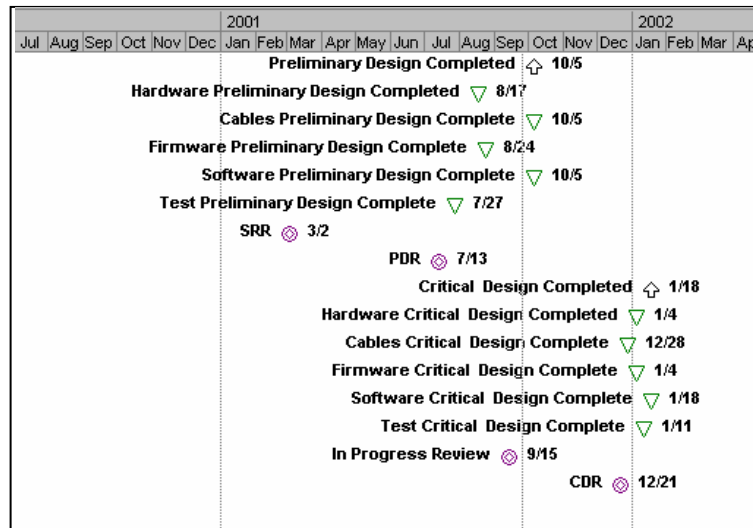
BCWS
BCWP
ACWP

The Work

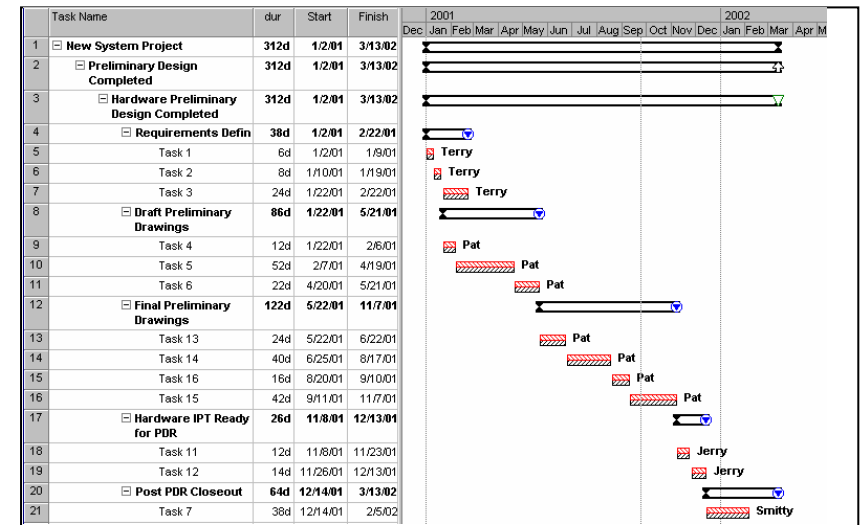
Network Diagram



MS



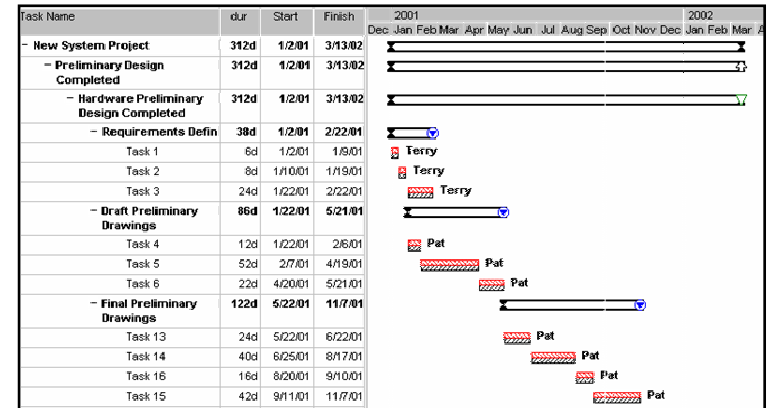
Gantt



Integrated Master Schedule

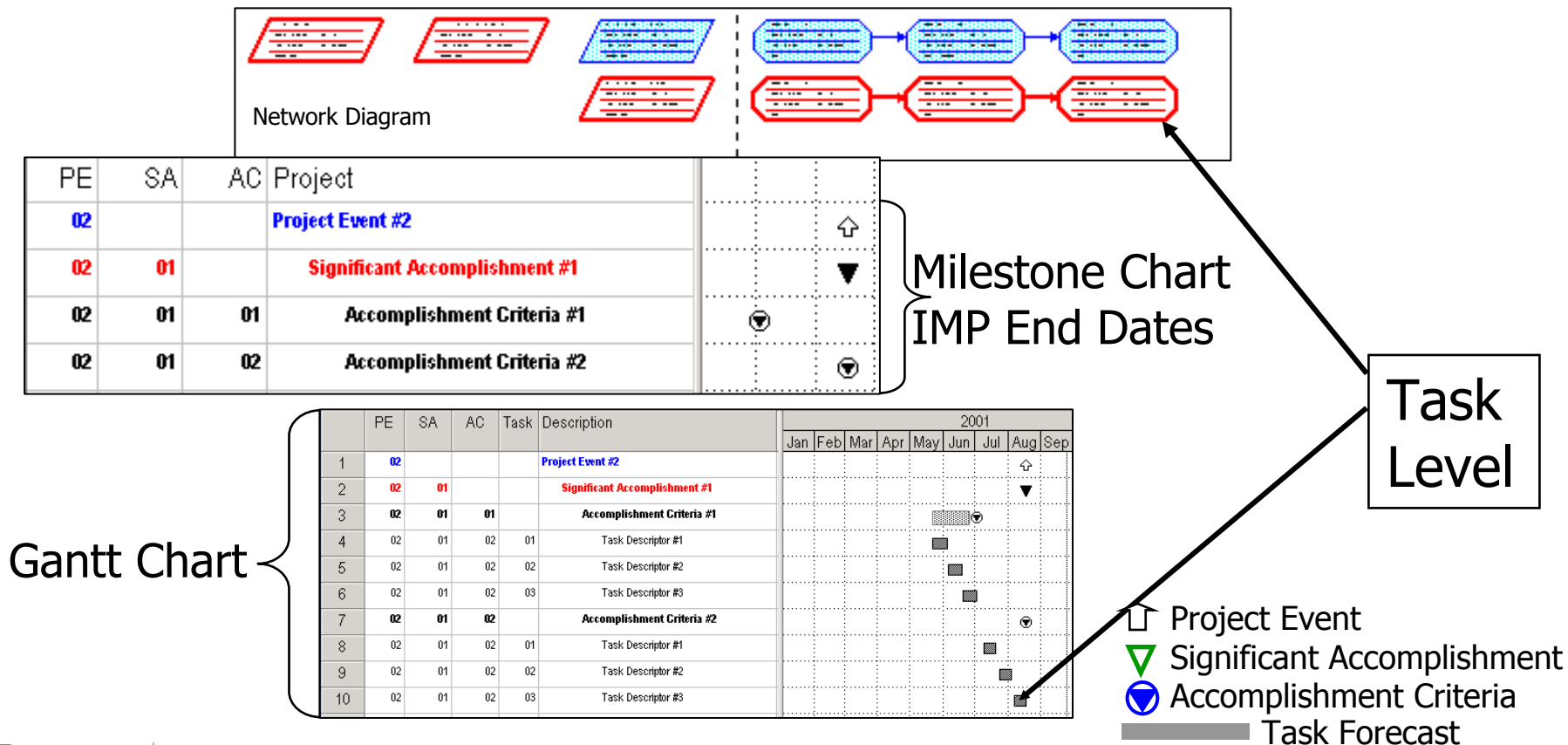
Used by government and contractor. The primary tools for tracking technical and schedule status and risk identification. An efficient method for evaluating product maturity.

- Time-phased
- Organized IAW IMP
- Horizontally trace to WBS
- Integrate IPTs with Interface Milestones
- Accurately calculate the Critical Path
- Vertically trace to Master and Intermediate Levels



IMS DID Format

“Format: The precedence logic diagram shall be in the form of a network, milestone, or Gantt chart.”



IMS DID Content

“Content: The schedule shall contain all of the contract IMP events and milestones, accomplishments, criteria, and activities from contract award to the completion of the contract.”

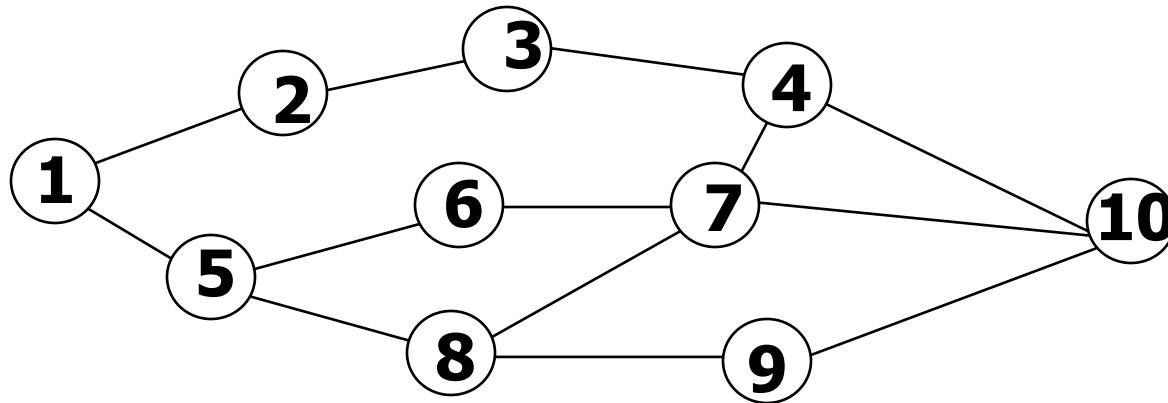


Integrated Master Plan									
PE	SA	AC	Project						
02			Project Event #2						
02	01		Significant Accomplishment #1						
02	01								
02	01								

Integrated Master Schedule														
	PE	SA	AC	Task	Description	2001								
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	02				Project Event #2									↑
2	02	01			Significant Accomplishment #1									▼
3	02	01	01		Accomplishment Criteria #1									
4	02	01	02	01	Task Descriptor #1									
5	02	01	02	02	Task Descriptor #2									
6	02	01	02	03	Task Descriptor #3									
7	02	01	02		Accomplishment Criteria #2									
8	02	01	02	01	Task Descriptor #1									
9	02	01	02	02	Task Descriptor #2									
10	02	01	02	03	Task Descriptor #3									

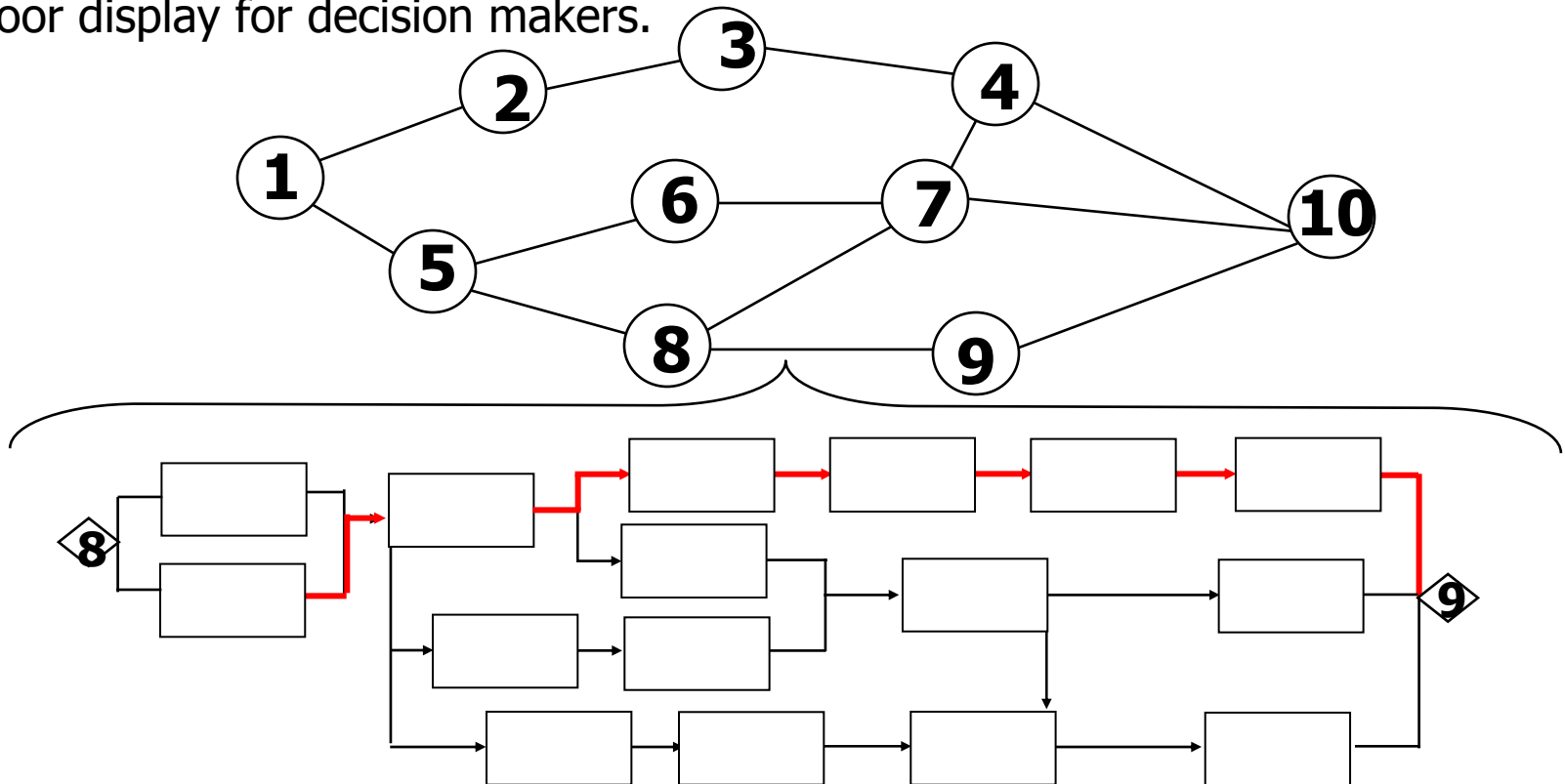
Schedule Methodology Evolves

Before computers (late 50s), the Arrow Diagram Method (ADM) was the method of Planning & Controls.



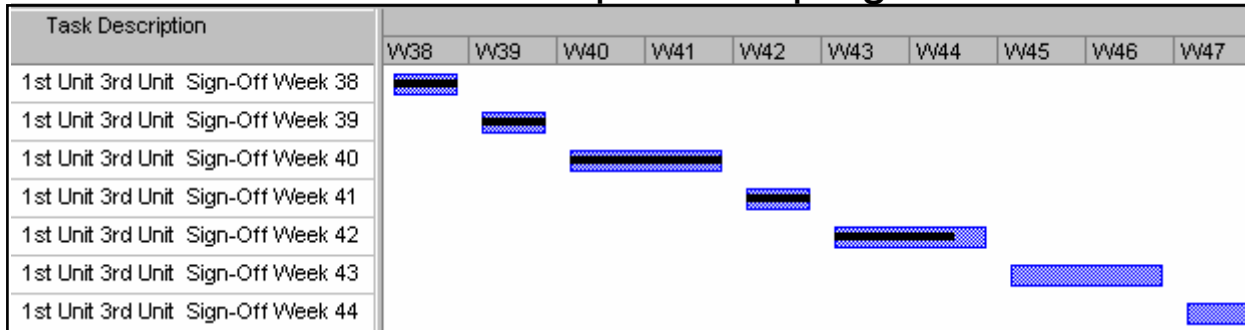
Precedence Diagram Method

In 1963, the Precedence Diagram Method (PDM) approach was introduced giving focus to tasks with duration that were linked together with dependency lines leading to the events. It is effective in the re-planning and analysis of alternate approaches and allows managers considerable flexibility but makes poor display for decision makers.

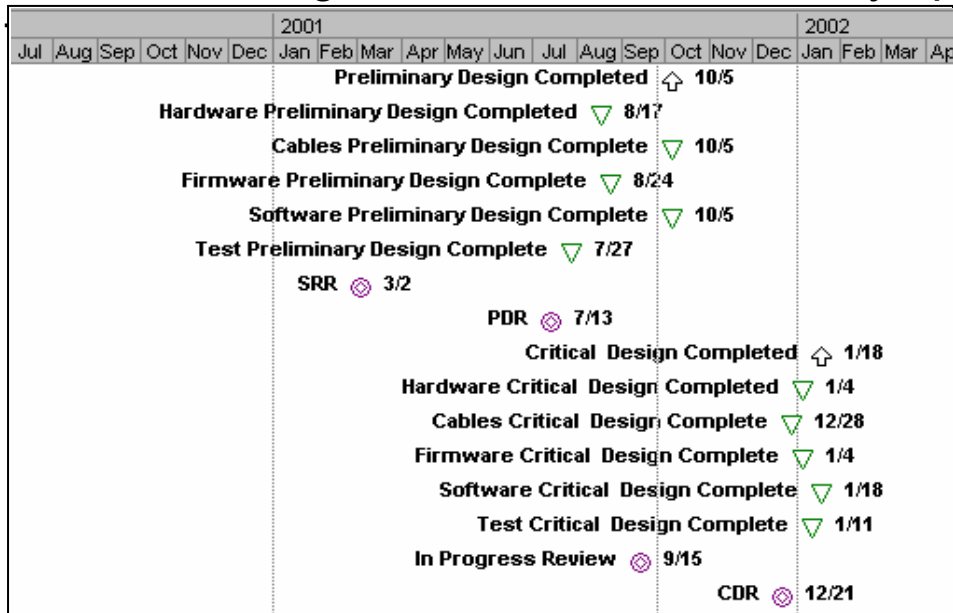


Viewing the Data

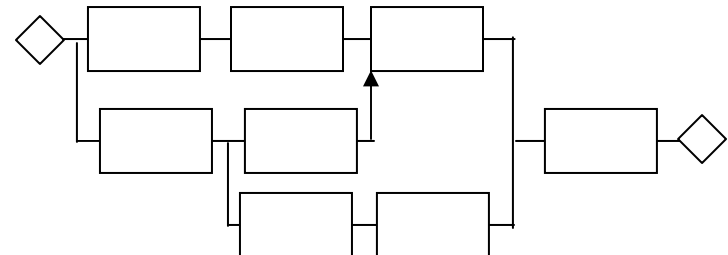
Gantt Chart - Time Phases plan and progress but does not display dependencies.



Milestone - Big Picture shows status only upon task completion



Network Diagram - Schedule at lowest level of detail. Provides maximum assurances of thought-out, logical, and thorough project controls. Results in a well defined path to completion.



What makes it Tick?



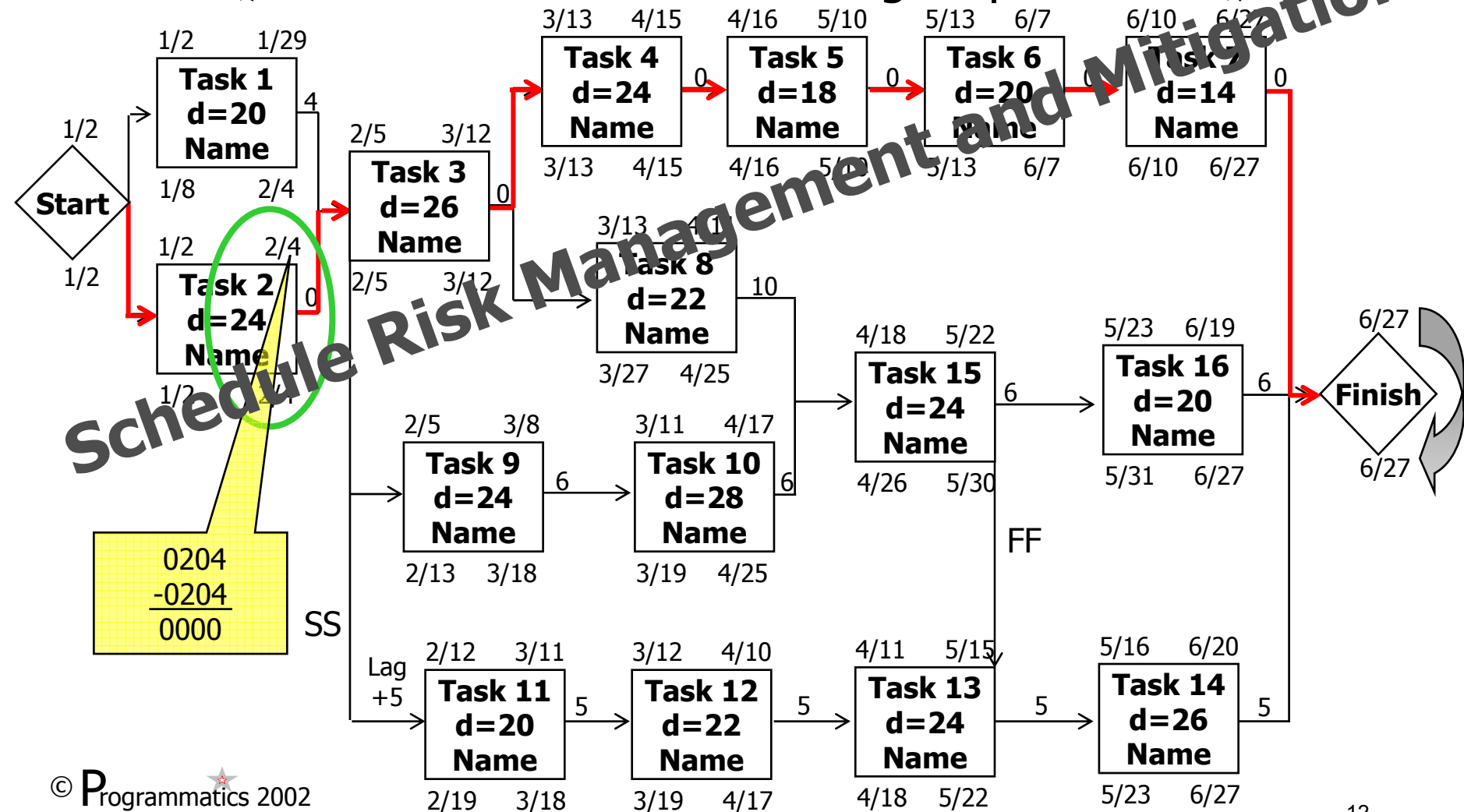
Calculating the Schedule
Forward Pass
Backward Pass
Total Slack
Critical Path

Calculating Schedule Dates

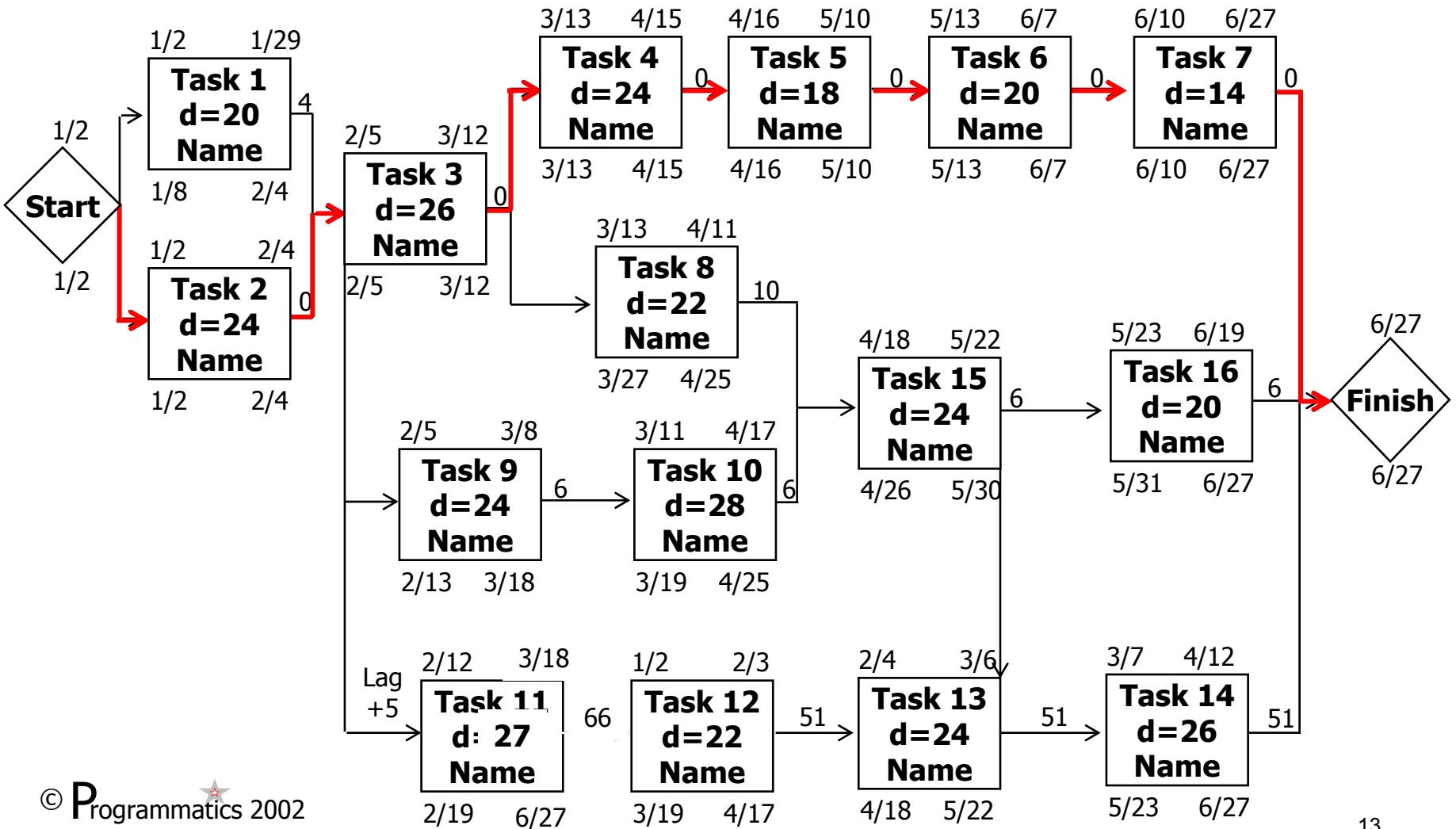
- *Calculations are based on:*
 - Project Start and Finish Dates
 - Project Calendar (holidays?)
 - Duration
 - Leads or Lags
 - Logical Relationships
 - Constraints
 - Resources (if available)
 - Existing progress (if applicable)

Total Slack and Critical Path

Subtract early from the corresponding late dates to calculate the total slack and the longest path.



Effect of a Broken Link



Hiding in the file

Disconnecting the successor hides slip and Misrepresents the Critical Path

	PE	SA	AC	Task Name	dur	Start	Finish	Slack
18	01	01	04	Task 11	25d	2/13/01	3/18/01	219d
19	01	01	04	Task 12	5d	1/2/01	1/8/01	134d
20	01	01	05	[-] Post PDR Closeout	25d	7/13/01	8/16/01	110d
21	01	01	05	Task 7	10d	7/13/01	7/26/01	110d
22	01	01	05	Task 9	20d	7/13/01	8/9/01	110d
23	01	01	05	Task 10	5d	8/10/01	8/16/01	110d
24	01	01	05	Task 8	5d	8/10/01	8/16/01	110d
25				Preliminary Design Complete	0d	8/16/01	8/16/01	110d
26	01	02		[-] Cables Preliminary Design Complete	199d	1/2/01	10/4/01	0d
27	01	02	01	Requirements Defined	40d	1/2/01	2/26/01	0d
28	01	02	02	Draft Preliminary Drawings Completed	35d	2/27/01	4/13/01	0d
29	01	02	03	Final Preliminary Drawings Completed	44d	6/16/01	6/14/01	0d

Name:	Task 11	Duration:	25d	<input checked="" type="checkbox"/> Effort driven	Previous	Next
Start:	2/13/01	Finish:	3/18/01	Task type:	Fixed Units	% Complete: 0%

ID	Predecessor Name	Type	Lag	ID	Successor Name	Type	Lag
9	Task 4	FS					

Sorting on Total Slack

The screenshot shows the Microsoft Project - IMS Analysis interface. The 'Sort' menu is open, displaying options: 'by Start Date', 'by Finish Date', 'by Priority', 'by Cost', 'by ID', and 'Sort by...'. The 'Sort by...' option is selected, opening the 'Sort' dialog box. In the dialog, 'Total Slack' is selected in the 'Sort by' dropdown, with 'Ascending' selected. The 'Then by' dropdown is empty, and 'Ascending' is also selected. The 'Permanently renumber tasks' and 'Keep outline structure' checkboxes are unchecked. The background shows a task list with columns for LI, Task Description, 8, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, and 1540. The task descriptions include 'End of Contract' and '1st Unit Install of Installation Kits'. The 'Task Details Form' at the bottom shows 'Name: 1st Unit 3rd Unit Checkout Weeks 38 - 51', 'Duration: 165d', 'Start: 10/15/01', 'Finish: 6/14/02', 'Constraint: As Soon As Possible', 'Date: NA', 'Priority: 500', and radio buttons for 'Current', 'Baseline', and 'Actual'.

Sort Dialog Box Settings:

- Sort by: Total Slack
- Ascending (selected)
- Descending
- Then by: (empty)
- Ascending (selected)
- Descending
- Permanently renumber tasks: ☐
- Keep outline structure: ☐

Sort on Total Slack

- Four Months Late (-83 working days)
- Major Milestone Concludes Installation, Test, and Sign-Off
- Logically Tied to Contract End
- Essential Equipment Delivers After Final Sign-off

LI	Task Description	PC	Dur	Start	Finish	Bfinish	Slack
1546	1st Unit Install of I-Kits Week 14	0%	5 d	6/10/02	6/14/02	3/29/02	-83 d
1576	1st Unit Install of CPU's, HDDC's, & KYBD's Week 14	0%	5 d	6/10/02	6/14/02	3/29/02	-83 d
1606	1st Unit Installs of Displays Week 14	0%	5 d	6/10/02	6/14/02	3/29/02	-83 d
1644	1st Unit 3rd Unit Sign-Off Week 15	0%	5 d	6/10/02	6/14/02	3/29/02	-83 d

Name:	1st Unit 3rd Unit Sign-Off Week 15		Duration:	5d	<input checked="" type="checkbox"/> Effort driven	Previous	Next
Start:	6/10/02	Finish:	6/14/02	Task type:	Fixed Duration	% Complete:	0%

ID	Predecessor Name	Type	Lag	ID	Successor Name	Type	Lag
1643	1st Unit 3rd Unit Sign-Off We	FS	0d	8	End of Year One Contract	FS	0d

Negative Total Slack

LI	Task Description	PC	TS	Dur	Start	Finish
1603	1st Unit Installations of Displays Week 11	0%	-83 d	5 d	5/20/02	5/24/02
1604	1st Unit Installations of Displays Week 12	0%	-83 d	5 d	5/28/02	6/3/02
1605	1st Unit Installations of Displays Week 13	0%	-83 d	4 d	6/4/02	6/7/02
1606	1st Unit Installations of Displays Week 14	0%	-83 d	5 d	6/10/02	6/14/02

Name: 1st Unit Installations of Displays Week 14 Duration: 5d ☒ Effort driven Previous Next

Dates: Start: 6/10/02 Finish: 6/14/02

Constraint: Start No Earlier Than Date: 4/8/02 Task type: Fixed Duration WBS code: 6.4.9.2.3.29

☒ Current ☐ Baseline ☐ Actual Priority: 500 % Complete: 0%

ID	Predecessor Name	Type	Lag
1605	1st Unit Installations of Displays Week 13	FS	0d

ID	Successor Name	Type	Lag
8	End of Contract	FS	0d

Task Information

General Predecessors Resources **Advanced** Notes

Name: End of Contract Duration: 0d ☐ Estimated

Constrain task

Deadline: 2/18/02

Constraint type: As Soon As Possible Constraint date: NA

Gaming the Schedule

25 lots of Installation Kits and 17 lots of Computer Systems are scheduled in a way that the first lot of I-Kits shows 99% credit for all. With electronic transfer of progress a misleading positive Variance and Performance Indices result.

LI	Task Description	PC	Dur	Start	Finish
1335	<input type="checkbox"/> Distribution of Installable A-Kits at 1st Unit	99%	127 d	7/9/01	1/16/02
1336	<input type="checkbox"/> I-Kit Distribution of Lots	99%	78 d	9/17/01	1/16/02
1337	I-Kit Distribution of Lots #1	100%	10 d	9/17/01	10/1/01
1338	I-Kit Distribution of Lots #2	0%	0 d	10/4/01	10/4/01
1339	I-Kit Distribution of Lots #3	0%	0 d	10/9/01	10/9/01
1340	I-Kit Distribution of Lots #4	0%	0 d	10/12/01	10/12/01
1341	I-Kit Distribution of Lots #5	0%	0 d	10/17/01	10/17/01
1342	I-Kit Distribution of Lots #6	0%	0 d	10/22/01	10/22/01
1343	I-Kit Distribution of Lots #7	0%	0 d	10/25/01	10/25/01
1344	I-Kit Distribution of Lots #8	0%	0 d	10/30/01	10/30/01
1345	I-Kit Distribution of Lots #9	0%	0 d	11/2/01	11/2/01
1346	I-Kit Distribution of Lots #10	0%	0 d	11/7/01	11/7/01
1347	I-Kit Distribution of Lots #11	0%	0 d	11/12/01	11/12/01
1348	I-Kit Distribution of Lots #12	0%	0 d	11/15/01	11/15/01
1349	I-Kit Distribution of Lots #13	0%	0 d	11/20/01	11/20/01
1350	I-Kit Distribution of Lots #14	0%	0 d	11/27/01	11/27/01
1351	I-Kit Distribution of Lots #15	0%	0 d	11/30/01	11/30/01
1352	I-Kit Distribution of Lots #16	0%	0 d	12/5/01	12/5/01
1353	I-Kit Distribution of Lots #17	0%	0 d	12/10/01	12/10/01
1354	I-Kit Distribution of Lots #18	0%	0 d	12/13/01	12/13/01
1355	I-Kit Distribution of Lots #19	0%	0 d	12/20/01	12/20/01
1356	I-Kit Distribution of Lots #20	0%	0 d	1/3/02	1/3/02
1357	I-Kit Distribution of Lots #21	0%	0 d	1/8/02	1/8/02
1358	I-Kit Distribution of Lots #22	0%	0 d	1/11/02	1/11/02
1359	I-Kit Distribution of Lots #23	0%	0 d	1/16/02	1/16/02
1360	<input type="checkbox"/> Distribution of Computer Systems to Other Platforms Lots #1 - 8 & 17 - 25	0%	113 d	7/9/01	12/18/01

Necessary Delays

Constraint - A restriction or limitation to start or finish.
Schedule should be 80 percent unconstrained with Finish to Start relationships.

Soft Constraint

(Allows calculation beyond)

As Soon As Possible

As Late As Possible

Start No Earlier Than

Finish No Earlier Than

Hard Constraint

(Stops everything – Zero Slack)

Must Start On

Must Finish On

Start No Later Than

Finish No Later Than

Deadline – Hybrid allows dates to calculate beyond but with Hard Total Slack

IMP to IMS Relationship

IMP Table

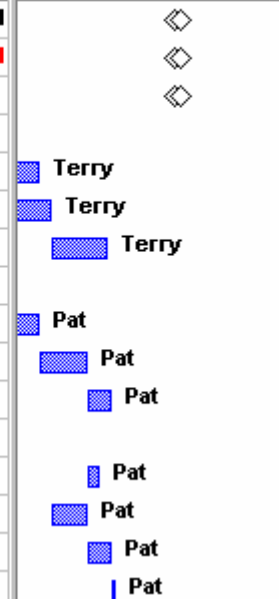
LI	PE	SA	AC	Task Description
1				New Product Project
2	01			Product Design Completed
3	01	01		Sys IPT - System Requirements Defined
4	01	01	01	Requirements Reviewed
8	01	01	02	Specifications Reviewed
12	01	01	03	Checked for Compliance
17	01	01	04	Sys IPT Ready for SRR
20	01	01	05	Sys IPT Post SRR Closeout
26	01	02		Sys IPT - Preliminary Drawings Completed
27	01	02	01	SRR Incorporation
31	01	02	02	Draft Preliminary Drawings Completed
35	01	02	03	Final Preliminary Drawings Completed
40	01	02	04	Sys IPT Ready for PDR
43	01	02	05	Sys IPT Post PDR Closeout
49	01	03		Sys IPT - Critical Drawings Completed
50	01	03	01	PDR Incorporation
51	01	03	02	Draft Critical Drawings Completed
52	01	03	03	Final Critical Drawings Completed
53	01	03	04	Sys IPT Ready for CDR
55	01	03	05	Sys IPT Post CDR Closeout
59	01	04		SW IPT - Software Requirements
60	01	04	01	Critical Flow Diagrams Completed

12	01	01	03
13	01	01	03
14	01	01	03
15	01	01	03
16	01	01	03

Detailing with tasks, activities, and milestones; time-phasing with durations, dependencies and sequencing relationships creates the IMS

Integrated Master Schedule (IMS)

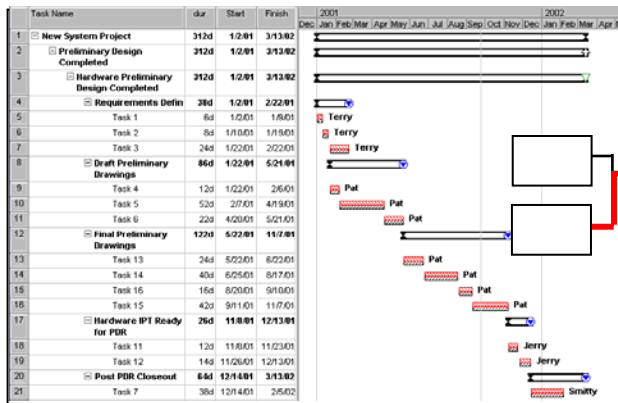
Task Description	Dur	2001	Jan	Feb	Mar	Apr	May
New Product Project	680d						
Product Design Completed	249d						
Sys IPT - System Requirements Defined	74d						
Requirements Reviewed	39d						
Task 1	10d						
Task 2	15d						
Task 3	24d						
Specifications Reviewed	40d						
Task 4	10d						
Task 5	20d						
Task 6	10d						
Checked for Compliance	27d						
Task 13	5d						
Task 14	15d						
Task 16	10d						
Task 15	2d						



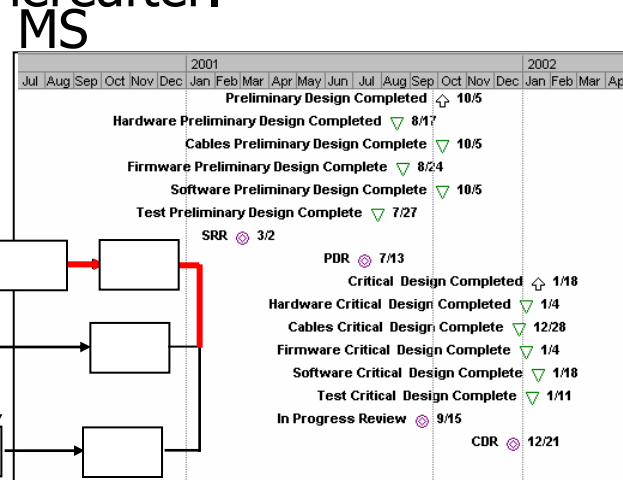
Suggested RFP IMS Wording

The Integrated Master Schedule file shall indicate all Project Events, Significant Accomplishments, and Accomplishment Criteria and supported by detailed tasks, activities, and milestones and their dependencies such that it calculates an accurate critical path. That file shall be in a Microsoft Project compatible format and allow the presentation of Gantt and Network Diagram charting and CMS filtering. The proposed IMS file shall be provided in hard and soft copy as a Schedule Volume attachment with the Offeror's proposal as an individual data item (CDRL) and monthly thereafter.

Gantt

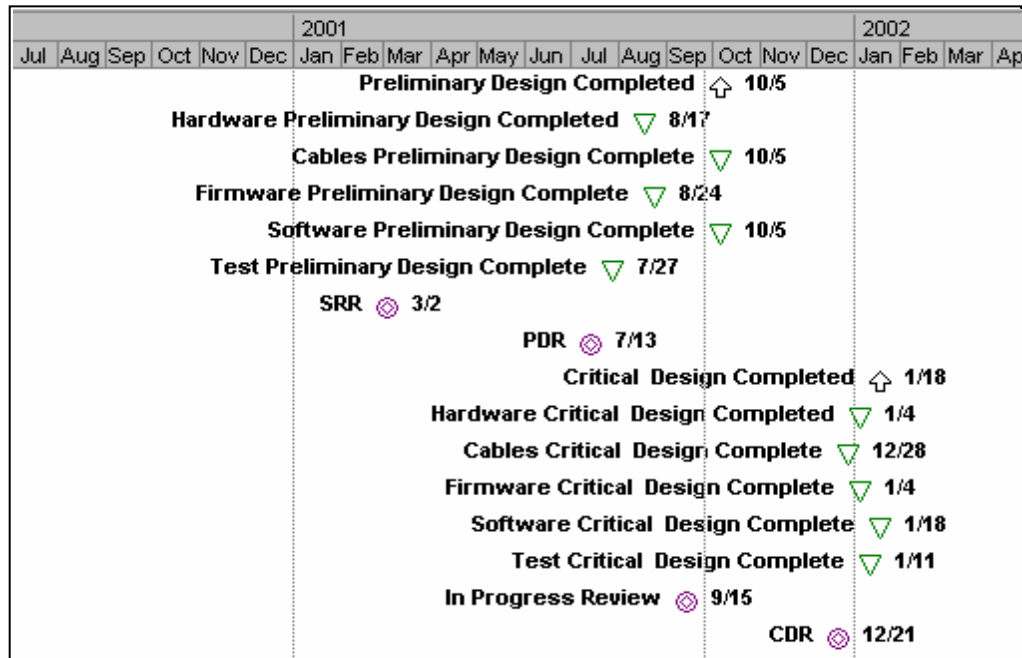


Network Diagram



Suggested RFP CMS Wording

The Offeror shall propose an integrated Contract Master Schedule (CMS) which supports the offeror's Integrated Master Plan. The proposed CMS file shall be provided with the offeror's proposal as an Attachment to the Management Volume. The CMS, as negotiated with the Government, will be attached to the contract upon award. Changes to the CMS after contract award will require contract modifications.



Conclusion

In a psychological study on productivity, office lights were increased. Productivity improved. To prove the theory, wattage was decreased. Productivity increased again. It was determined that productivity increases as a result of being watched.

Inform the contractor that the schedule will be used as a communication tool. Evidence with monthly reports of schedule information, whether that is a report of progress or of a broken schedule. Enhanced performance measurement and forecast calculation will result and performance may improve.